

Application Serial No. 10/021,747
Response dated January 26, 2004
Response to Office Action of September 25, 2003

REMARKS

This response is being filed in response to an Office Action dated September 25, 2003. Claims 1, 2 and 4-7 are pending in this application, stand rejected, and have been maintained unchanged. Applicant respectfully requests reconsideration of the present application in light of the following remarks.

The Rejections Under 35 U.S.C. § 103

Claims 1, 2, and 4-7 were rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,489,466 to Inaba et al. ("Inaba") and U.S. Patent No. 5,747,157 to Hashimoto et al. ("Hashimoto") in view of U.S. Patent No. 6,607,806 to Kato et al. ("Kato").

Prior to addressing each of the prior art references individually, Applicants take this opportunity to set forth the following brief remarks in connection with their invention, which is a cleaning medium for magnetic recording medium.

The technical object of the present invention is to provide a cleaning medium for a magnetic recording apparatus, which has high cleaning power to a magnetic head, does not scratch the magnetic head, and provides reduced head abrasion.

The invention removes debris on the surface of a magnetic head as it runs in sliding contact with the magnetic head. Accordingly, the cleaning layer of the invention is preferably softer than the magnetic layer used for magnetic recording and includes protrusions on the surface to provide cleaning capabilities. Therefore, its configuration is different from that of a magnetic recording medium.

In order to achieve the aforementioned technical objectives, Applicants developed a cleaning medium comprising a nonmagnetic support, having provided thereon a lower coating

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layer, and a cleaning layer on the lower coating layer. The cleaning layer contains at least a ferromagnetic inorganic powder and a binder. In use, the cleaning layer runs in sliding contact with a head to remove debris from the head. The cleaning layer preferably has a thickness from about 0.05 to 1.0 μm , the thickness of the lower coating layer is preferably from about 0.2 to 5.0 μm , the thickness of the support is preferably from about 2.0 to 10 μm , and the total thickness of the cleaning medium (cleaning tape) is preferably from about 4.0 to 15 μm . The cleaning layer is preferably produced by one of the various methods disclosed in the specification, wherein a resin roll and a metal roll are used in the calendaring step. The resulting cleaning layer is preferably softer than a magnetic layer used for magnetic recording.

An important aspect of the cleaning medium, helpful to obtain appropriate cleaning performance, is the presence of 5 to 80 protrusions with a height of 35 to 100 nm/900 μm on the surface of the cleaning layer. It is also advantageous that the cleaning layer contain fatty acid amides, fatty acids and fatty acid esters to optimize the frictional coefficient with the head. Thus, the presence of these protrusions on the surface of the cleaning layer where they contact the head helps distinguish the invention from a cleaning medium from ordinary recording tape.

With regard to Inaba, the Examiner asserts that although Inaba does not refer to its lower nonmagnetic layer and an upper magnetic layer as cleaning and lower coating layers respectively, because they are allegedly made of the same material, the Examiner states that they are functional equivalents. With regard to Hashimoto, the Examiner alleges that Hashimoto teaches a magnetic recording medium that removes dust and fluff accumulation. The Examiner then asserts that it would have been obvious to one of ordinary skill in the art to modify the

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magnetic recording medium to provide a cleaning property. Applicants respectfully traverse these rejections.

Inaba and Hashimoto are fundamentally different from the invention. Neither Inaba nor Hashimoto teaches a cleaning medium, with surface protrusions, which has high cleaning power to a magnetic head, does not scratch a magnetic head, and provides reduced head abrasion, as does the present invention. The objectives of Inaba, in contrast, are to obtain a magnetic recording medium in which the top layer has a desirable electromagnetic conversion characteristic, low dispersibility of the lower nonmagnetic layer, surface smoothness, running properties and storage stability (col. 3, lines 27-34). Hashimoto's objectives are high dispersibility, long storage stability and durability of a magnetic recording medium under a wide range of temperatures and humidity conditions. The objectives of both Inaba and Hashimoto are in stark contrast to the objectives of the invention, and thus Inaba and Hashimoto do not teach or suggest the invention or its objectives and are fundamentally different from the invention. Accordingly, it would not have been obvious to someone skilled in the art to modify the teachings of Inaba or Hashimoto to obtain the invention and its results.

There are meaningful differences between a cleaning layer and the surface of the recording tape. Applicants note that those of ordinary skill in the art would understand very well that a cleaning layer is typically designed to be softer than a magnetic layer used for magnetic recording. Also, as claimed, the cleaning layer has protrusions on the surface to provide cleaning ability. Inaba and Hashimoto lack these protrusions. Moreover, as they are concerned with continuous and uniform contact with the head for proper recording and playback, there would be no reason to add the claimed protrusions to the surface of the tape. This softer cleaning layer can

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be obtained by producing the cleaning medium by the various methods disclosed in the specification as filed, for example, using a resin roll and a metal roll in the calendaring step. In contrast, the magnetic media of Inaba and Hashimoto are produced using a calendaring apparatus having only metal rolls. Using such a calendaring apparatus, neither Inaba or Hashimoto is able to produce an upper magnetic layer, which the Examiner asserts correlates to the cleaning layer, with a degree of softness suitable for cleaning media, as required and achieved by the invention.

Furthermore, Inaba and Hashimoto fail to teach or suggest the necessary cleaning elements of the invention. Namely, both Inaba and Hashimoto do not teach a cleaning layer that has "5 to 80 protrusions having a height of from 35 to 100 nm per 900 μm^2 " and "fatty acid amide, fatty acid and fatty acid ester". The presence of 5 to 80 protrusions of the specified height and distribution helps achieve an appropriate cleaning performance to an MR head, which Inaba and Hashimoto fail to teach or suggest. Instead, both Inaba and Hashimoto disclose that excellent smoothness of the surface is desirable, and therefore teach away from the presence of protrusions on the surface of the medium. Also, even if a lubricant is incorporated into the magnetic recording medium of Inaba, the function of the lubricant is to secure the lubricating property of the magnetic recording medium, and therefore the lubricant would have no effect on the formation of superficial protrusions in the magnetic recording medium. Therefore it would not have been obvious to someone skilled in the art to add the specified protrusions onto the magnetic recording media of Inaba and Hashimoto.

The fatty acid amide, fatty acid and fatty acid ester help to optimize the abrasion coefficient with the head and to reduce head abrasion, which Inaba and Hashimoto also fail to teach or suggest. Because of the fundamentally different nature of the magnetic recording

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medium of Inaba and Hashimoto from the invention, it would not have been obvious to one skilled in the art to modify the teachings of Inaba or Hashimoto to provide the protrusions and lubricant of the invention in order to obtain the desired cleaning performance with reduced head abrasion.

Regarding Inaba, the Examiner states that Inaba teaches a magnetic recording medium comprising the same material as the invention and therefore are functional equivalents. However, Applicants draws the Examiner's attention to the fact that the magnetic layer of Inaba does not include fatty acid amide. In the invention, the presence of the fatty acid amide, fatty acid and fatty acid ester is essential to help provide the desired low head abrading property of the invention despite the presence of specified protrusions. Without the presence of fatty acid amide, Inaba cannot acquire the required low abrading property in order to warrant calling Inaba a functional equivalent of the invention.

Regarding Hashimoto, the Examiner asserts that Hashimoto teaches a magnetic recording medium that removes dust and fluff accumulation. However, Applicants respectfully assert that Hashimoto does not teach a magnetic recording medium that removes dust and fluff. First, Hashimoto fails to teach the features necessary for cleaning, namely, the specified protrusions having the specified distribution, and the incorporation of an aliphatic acid amide, aliphatic acid and aliphatic acid ester. Therefore, Hashimoto does not provide a medium suitable for removing dust and fluff. Second, the magnetic recording medium of Hashimoto does not remove dust and fluff accumulation as the Examiner asserts is taught in column 16, lines 36-68 and Table 2. Rather, while determining repeated operation performance of a tape, the tape was passed repeatedly over a head to observe dust and fluff accumulation. The observations were limited to

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"acceptable", which meant "no dust and fluff were observed" and "unacceptable", which meant "dust and fluff were visually observed". Hashimoto does not teach removing dust and fluff, but a magnetic recording medium that does not produce visible dust and fluff accumulation. The absence of dust and fluff accumulation is not equivalent to the removal of dust and fluff that already exists on a head. Also, it is notable that the test was done to determine "repeated operation performance", which is consistent with the objectives of Hashimoto, which include excellent operation durability and storability. It is clear from the specification, including the various tests that were done, that Hashimoto does not teach or suggest the invention or its objectives. Accordingly, it would not have been obvious to someone skilled in the art to modify the teachings of Hashimoto to obtain a cleaning medium as provided in the invention.

The Examiner relies upon Kato to provide the missing elements that Inaba and Hashimoto fail to provide. However, Applicants respectfully assert that Kato fails to resolve the deficiencies of Inaba and Hashimoto. First, Applicants respectfully assert that Kato also is fundamentally different from the invention and has objectives that would make it improbable for someone skilled in the art to modify Kato's teachings to obtain either the invention or the results obtained by the invention. Kato is directed to a magnetic recording medium having excellent still durability and head staining characteristics, and not to obtaining a cleaning medium that has high cleaning power for a magnetic head, does not scratch a magnetic head, and minimizes head abrasion. Therefore Kato is fundamentally different from the invention and it would not have been obvious to someone skilled in the art to modify Kato's teachings to produce the invention and to obtain its results.

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The Examiner states that Kato discloses the use of fatty acids including esters and amines having a lubricant effect, wherein lubricants are coated on the surface of the magnetic layer. The Examiner further asserts that Kato teaches that the number of protrusions, height, and distribution are optimizable and affect the surface characteristics of a film. Applicants respectfully traverse these assertions. First, Kato fails to teach or suggest that in order to achieve the appropriate cleaning performance for an MR head, the protrusions must comply with the requirements of the invention. Since Kato is directed to a magnetic recording medium in which smoothness is desirable, and any protrusions are minimized to maintain smoothness (col. 10, lines 48-56), it would not have been obvious to someone skilled in the art to purposefully provide protrusions as required in the invention, especially to provide protrusions for the purpose of engaging the recording head for cleaning.

Second, the protrusions described in Kato are fundamentally different from the protrusions of the invention. The invention requires protrusions on the cleaning layer, which is the surface of the cleaning medium that engages the recording head to remove debris. The protrusions of Kato, on the other hand, are on the support, which is the base of the medium, not the surface (col. 10, lines 53-64). Therefore, the protrusions of Kato cannot help provide the appropriate cleaning performance as the protrusions of the invention can. Accordingly, Kato fails to teach or suggest the protrusions of the invention or their function.

Additionally, Kato is directed to a medium comprising a single-layered magnetic coating, in which protrusions such as those of the invention cannot be achieved. Even if a resin roll and a metal roll are used in the calendaring process, the abrasive agent and the like incorporated in the uppermost layer of Kato will not come up to the surface. A softer cleaning layer on a harder

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lower layer is necessary for the abrasive agent in the cleaning layer to come out to the surface, thereby providing the desirable surface protrusions. Kato does not possess the requisite layers and therefore cannot provide the protrusions of the invention and makes it improbable for one skilled in the art to modify Kato to produce such protrusions.

Inaba and Hashimoto taken in light of each other and/or Kato fail to teach all the elements of the invention. None of the references teach providing the specified protrusions on the surface of the medium, more specifically, the specified protrusions in order to achieve the appropriate cleaning performance. Not only are the protrusions not taught, it is unobtainable in the medium taught by Kato. Additionally, the characteristics of Inaba and Hashimoto make the soft cleaning layer of the invention unobtainable. Therefore, even if the teachings of Inaba, Hashimoto and Kato are combined, the invention is neither taught nor suggested. Furthermore, all of the references are directed to optimizing the performance of a magnetic recording medium, and therefore teach away from the invention. Because of the spacing loss caused by the specified protrusions, the electro-magnetic conversion characteristic cannot be attained for the medium. Therefore the cleaning layer of the invention is not suitable for use as a recording layer, and it would not have been obvious to modify the teachings of Inaba, Hashimoto and Kato, which are all directed toward optimizing the performance of a magnetic recording medium, in order to produce the invention, which is not suitable as a recording medium. Applicants respectfully assert that Inaba, Hashimoto and Kato fail to teach every element of the invention and further teach away from the invention, and accordingly, do not render the invention obvious.

For all the foregoing reasons, favorable reconsideration and withdrawal of this rejection are respectfully requested.

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CONCLUSION

Applicants respectfully submit that all outstanding rejections have been addressed and are now either overcome or moot. Applicants further submit that all claims pending in this application are patentable over the prior art. Favorable reconsideration and withdrawal of those rejections and objections is respectfully requested.

Favorable consideration and prompt allowance of this application is respectfully requested. In the event that there are any questions, or should additional information be required, please do not hesitate to contact Applicants' attorney at the number listed below.

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